



# ASSESSMENT ON CONSUMPTION OF NON-VEGETARIAN FOODS DURING LOCKDOWN PERIOD IN FEMALES AGED 20-40 YEARS OF MUSLIM COMMUNITY

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## ABSTRACT

**Background data:** The covid-19 pandemic led to an enforcement of lockdown throughout the country which led to closure of supply of non-vegetarian foods. **Objective:** The study was conducted for assessment of consumption of Non-Vegetarian foods during lockdown period in females aged 20-40 years of Muslim Community. **Methodology:** An online google form questionnaire consisting of FFQ was circulated among 100 respondents and data was collected. **Results:** The results obtained were that there was reduced availability of non-vegetarian foods during lockdown period where meat, fish were least available. Some people avoided Non-Vegetarian foods consumption due to fear of Covid-19 which further led to sudden decrease in the chicken, meat and fish consumption ( $p=0.001$ ). This dietary changes led to increase consumption of protein source vegetarian foods such as pulses, legumes, milk and milk products during lockdown period ( $p=0.002$ ), although nuts and oilseeds consumption was decreased. The Body Mass Index (BMI) of participants were also improved during lockdown period ( $p=0.306$ ) as many people transformed into normal BMI category. The participants self-reported that they developed health problems such as joint pain, muscle pain, fatigue, skin problems, hair fall, bone related issue and decreased immunity. Also decreased haemoglobin levels, Vitamin B12, Iron, Calcium and Vitamin D deficiency. These health issues developed may be because of decreased protein intake during lockdown period. **Conclusion:** Awareness must be created among participants about the protein rich vegetarian sources and the ways to increase its bioavailability so as to mitigate health issues.

**KEYWORDS:** Non-vegetarian diet, Vegetarian diet, protein, consumption, foods.

## 1. INTRODUCTION:

Muslim follows a diet consisting of food that is halal and avoid foods such as pork and alcohol as it is prohibited. Therefore, Muslims are mainly non-vegetarians as eating chicken, meat and fish is allowed in their religion. (Budhism et al., 2021)

The covid-19 pandemic has been a health emergency all over the world affecting the country and its people. The pandemic led to enforcement of complete lockdown in countries like India to prevent the spread of disease. There was a complete lockdown for more than one and half months. It had the worst impact on crops, livestock and poultry. The lockdown led to closure of supply of meat which resulted in reduced availability of non-vegetarian foods. The poultry sector was impacted much before the lockdown was implemented in the country. There were rumors that poultry birds were the carrier of coronavirus which resulted in reduced demand of chicken in the country. The unavailability of non-vegetarian foods had a large impact on people who consumes non-vegetarian diet especially people belonging to Muslim community whose main meals are mostly non-vegetarian. This unavailability had a lot of changes in their dietary pattern which might have affected them nutritionally. (Biswal et al., 2020)

Protein is known as the building block of amino acids. Protein is available in a variety of dietary sources. These include foods of both animal and plant origins. The protein from animal sources are considered as the complete proteins. Complete protein contains all of the essential amino acids. Proteins from vegetable sources are considered as incomplete proteins because they generally lack one or two essential amino acids. Thus people consuming vegetarian diets need to consume protein from different vegetarian sources such as vegetables, fruits, grains, and legumes to ensure consumption of all the essential amino acids. (Millward et al., 2008)

There are certain nutrients that need to be considered by vegetarians. They are as follows: 1. Protein: Protein when consumed from a variety of plant food eaten throughout the day will supply all the essential amino acids when calorie intake is inadequate. 2. Iron: The consumption of iron for vegetarians or non-vegetarian is almost similar but then also the iron stores of vegetarians is less than that of non-vegetarian. The non-heme iron bioavailability is also affected by various factors such as inhibitors, phytates, polyphenols, and enhancers such as vitamin C and citric acid. 3. Calcium: Lacto-ovo-vegetarians meet the calcium demand. The bioavailability of calcium from plant food is related to oxalate content from food and to a smaller amount phytate and fibre content is also important to consider. The calcium absorption from high oxalate vegetables such as spinach, beet-green is as low as 5%. Therefore, they cannot be considered as good sources despite their high calcium content. The low-oxalate such as kale, turnip green, Chinese cabbage and bok choy has absorption of about 50%. The calcium needs can be met by encouraging good calcium sources and sometimes giving low-dose calcium supplements. 4. Vitamin-D: Vitamin D status depends on exposure of sunlight, vitamin D fortified foods and supplements. Low vitamin D or low serum 25-hydroxy vitamin D levels are reported in vegetarians and vegans. Egg provides a small amount of vitamin D. Mushrooms when treated with ultraviolet

light can become a good source of vitamin-D. 5. Vitamin B12: Plant food does not contain vitamin B12. Tempeh, spirulina, chlorella, algae and nutritional yeast can be considered as practical sources of B12. Vegetarians should include these sources because 1 cup of milk does not provide vitamin B12 as recommended by RDA. (Tuso et al., 2013)

## 2. MATERIALS AND METHODS:

### Aim:

- To evaluate the consumption pattern of non-vegetarian foods during lockdown period in females of Muslim community aged 20-40 years.

### Objectives:

- To collect data on the protein sources consumed instead of non-vegetarian foods during lockdown period because of its unavailability.
- To determine protein deficiency due to change in protein sources from high BV (Biological Value) protein to low BV protein.
- To assess the deficiencies developed during the lockdown period due to decreased consumption of non-vegetarian foods.

### Hypothesis:

- Lockdown had no effect on Non-vegetarian foods consumption in Muslim Community during lockdown period.

**Ethical Consideration:** The research proposal entitled "Assessment on consumption of non-vegetarian foods during lockdown period in females aged 20 – 40 years of Muslim Community." was approved by the Institutional Ethical Committee (IEC) of Dr. BMN College of Home Science.

**Age:** 20 – 40 years

**Gender:** Female

**Inclusion Criteria:** Only females belonging to Muslim Community.

**Exclusion Criteria:** Females not belonging to Muslim Community.

**Study Site:** The participants were selected from different areas of Thane District.

**Sample Size and Sample Selection:** A cross-sectional study with the sample size of 100 was conducted among the females aged 20- 40 years of Muslim Community from different cities of Thane District. Purposive Sampling method was being chosen for study as only females from Muslim community were included into study. The participants were selected for the study purely based on their willingness to participate. The participants were informed about the study conducted, its design and the purpose of the study.

**Data Collection:** Data collection is done by using questionnaires and food fre-

quency questionnaire.

**Data Analysis:** The data was then given to statistician for analysis.

### 3. RESULTS AND DISCUSSION:

#### 3.1 Age of Participants:

There were a total 100 participants among which 76% of participants were of age group 21-30 years, 14% of participants were of age group 31-40 years and 10% of participants of 20 years of age.

#### 3.2 Socio- economic status:

68% of participants belonged to the medium socio-economic category. 29% of participants were from low SES category and minimal percent of participants were from high SES category.

#### 3.3 BMI of Participants:

The BMI of participants were assessed before and during lockdown to determine whether change in protein source in meals has affected their BMI. 15% participants transformed into normal BMI category from underweight category. 9% participants transformed into normal category from overweight category. Thus, lockdown led dietary changes had a positive impact on the BMI of participants.

The BMI of participants were higher ( $2.23 \pm 1.033$ ) before lockdown when compared with BMI of participants during lockdown period ( $2.17 \pm 0.954$ ). There was no significant relationship between BMI of participants before and during lockdown period ( $p=0.306$ ).

#### 3.4. Non-Vegetarian foods consumption before lockdown period:

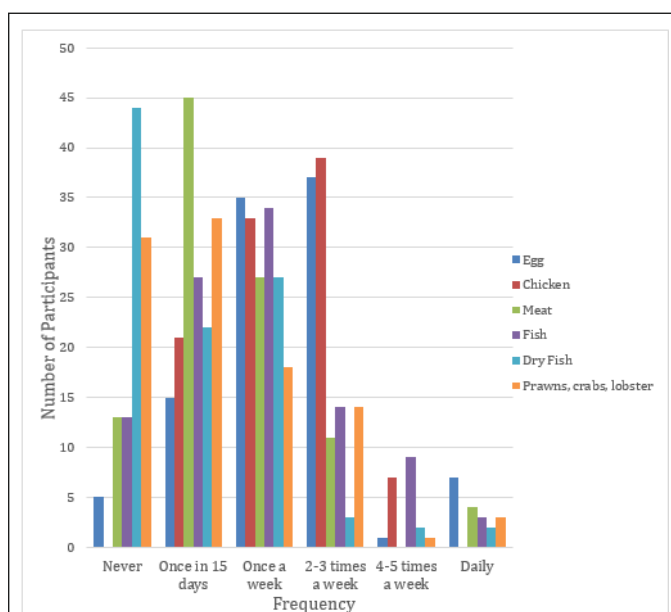


Fig 3.1: Before lockdown period-Non-vegetarian foods consumption

37% participants consumed eggs two-three times a week followed by 35% participants who consumed eggs weekly. 15% participants reported eggs consumption fortnightly while only 5% participants had never consumed eggs. 1% of participants consumed eggs four to five times a week and 7% of participants had consumed eggs daily.

39% participants had consumed chicken two-three times a week followed by 33% participants who consumed chicken weekly. 21% subjects reported having consumed fortnightly and 7% subjects had consumed four-five times a week while none of the participants had consumed chicken daily before lockdown period.

45% participants had consumed red meat fortnightly before lockdown while 27% participants had consumed once a week, 11% consumed 2-3 times a week and only 4% participants had consumed daily.

13% participants had never consumed fish while 27% participants consumed it fortnightly. 34% participants had consumed fish weekly. 14% participants consumed fish two-three times a week while 9% participants consumed it four-five times a week.

22% participants consumed dry fish fortnightly followed by 27% participants who consumed dry fish once a week and 44% participants had never consumed dry fish before the lockdown period. Only 3% participants were seen consuming dry fish two- three times a week..

31% participants had never consumed prawns, crabs and lobster before the lockdown period while 33% participants had consumed it fortnightly. 18% participants consumed prawns, crabs, lobster once a week while 14% participants had consumed it two-three times a week. (Fig No. 3.1)

#### 3.5. Non-Vegetarian foods availability during lockdown period:

The participants were given a checklist of non-vegetarian foods available in their locality during the lockdown period. 32.9% participants had availability of eggs, Chicken was available in 29.4% participant's locality. Meat was available to only 13.2% participants, fish was available to 8.3% participants while dry fish, prawns, crabs and lobsters were available to only 3.5% participants. Thus, there was a steep decline in non-vegetarian foods availability which had contributed to decrease non-vegetarian food consumption during the lockdown period.

The participants were asked the reason for not consuming non-vegetarian foods during the lockdown period. 42% participants reported unavailability of non-vegetarian foods in their locality while 24% didn't consume due to fear of Covid-19 while 34% participants didn't consume non-vegetarian foods due to both- fear of covid-19 and unavailability of non-vegetarian foods.

#### 3.6. Cravings for Non-Vegetarian foods:

The participants were asked the frequency of cravings they felt for non-vegetarian foods during lockdown period. 11% participants reported that they never felt cravings while 17% participants always had cravings and 72% participants sometimes felt cravings. Chicken was the most liked food among 61% participants followed by fish with 32% participants craving for it. 27% participants craved prawns, crabs, lobster and 24% participants craved meat. Only 6% of participants craved dry fish. There were 9% participants who liked all the non-vegetarian foods and therefore, they might be the participants who haven't consumed any kind of non-vegetarian food during the lockdown period.

#### 3.7. Meal options:

49% participants felt there were only few options remaining for preparing meals as non-vegetarian foods were not being cooked while the remaining 51% participants didn't feel the same.

#### 3.8. Non-Vegetarian foods consumption during lockdown period:

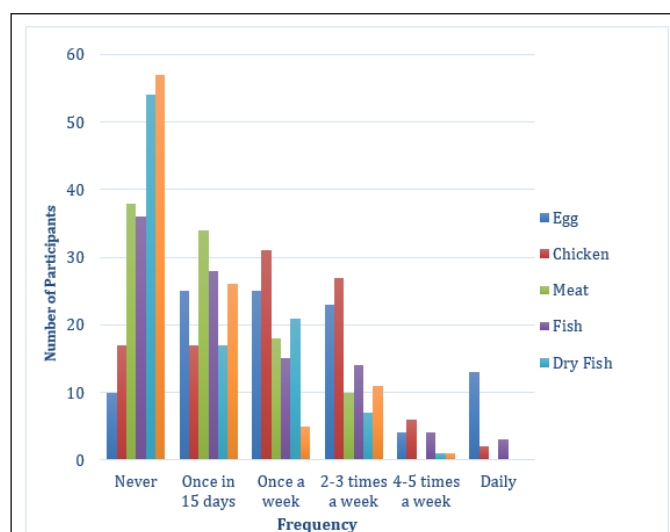


Fig 3.2: During lockdown period- Non-vegetarian foods consumption

The assessment on consumption of non-vegetarian foods during lockdown period was done to compare its consumption before lockdown period. 10% participants had never consumed eggs during the lockdown period. 25% participants had consumed eggs weekly while another 25% participants had consumed eggs fortnightly. It was followed by 23% participants consuming it two-three times a week while 13% participants used to consumed eggs daily.

17% subjects had never consumed chicken during lockdown period while another 17% subjects had consumed fortnightly. 31% subjects reported having consumed chicken weekly while 27% subjects had consumed two-three times a week.

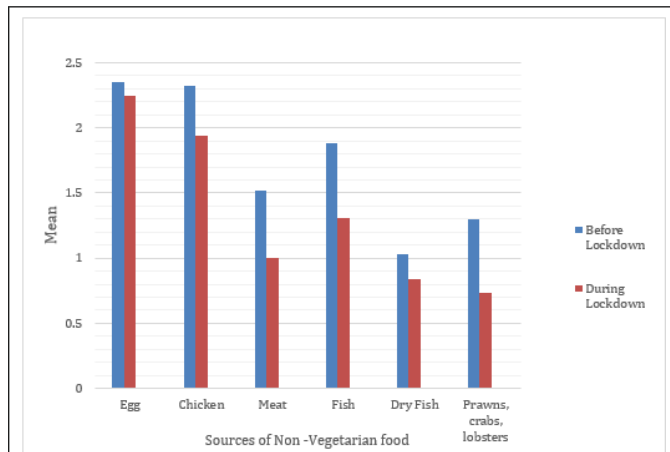
38% participants had never consumed red meat during the lockdown while 34% participants had consumed meat fortnightly. 18% participants had consumed meat once a week and only 10% participants were seen consuming two-three times a week. None of the participants reported consuming meat on a daily basis.

36% participant had never consumed fish during lockdown period while 28% participants had consumed fortnightly. 15% participants had consumed fish weekly while 14% participants had consumed it two-three times a week and 3% participants had consumed daily.

54% of respondents had never consumed dry fish during the lockdown period. 17% participants used to consume fortnightly, 21% participants had it

once a week while only 7% participants used to consume two-three times a week

57% participants had never consumed prawns, crabs and lobster during the lockdown period. 26% participants used to consume it fortnightly while only 5% participant had consumed it once a week and 11% used to consume it two-three times a week, (Fig No. 3.2)



**Fig 3.3: Paired Samples Statistics of Before & During lockdown period-Non-vegetarian foods consumption**

The non-vegetarian foods consumption before and during lockdown period showed that it was higher for egg ( $2.35 \pm 1.132$ ) before lockdown when compared with during lockdown period egg consumption ( $2.25 \pm 1.473$ ). There was no significant relationship between before and during lockdown period egg consumption ( $p = .438$ ). The consumption of chicken was higher before lockdown which significantly reduced ( $1.94 \pm 1.246$ ) during lockdown period ( $p = 0.001^{**}$ ). Similarly, the meat consumption was higher before lockdown ( $1.52 \pm 1.105$ ) which showed significant decline ( $1.00 \pm 0.985$ ) during lockdown period ( $p = 0.001$ ). The fish consumption before lockdown was higher ( $1.88 \pm 1.249$ ) which significantly reduced ( $1.31 \pm 1.354$ ) during lockdown. The significant relationship was found between before and during the lockdown period fish consumption ( $p = 0.001$ ). The dry fish consumption was found to be higher before lockdown ( $1.03 \pm 1.159$ ) which showed significant decrease during lockdown ( $0.84 \pm 1.051$ ) and is non-significant ( $p = 0.173$ ). Similarly, prawns, crabs, and lobster consumption was higher before the lockdown period ( $1.30 \pm 1.243$ ) which significantly declined during the lockdown period ( $0.73 \pm 1.043$ ). The significant relationship was observed between before and during the lockdown period prawns, crabs, lobster consumption. ( $p = 0.001$ ). (Fig No. 3.3)

### 3.8. Protein source vegetarian foods consumption:

**Table No 1: Protein source vegetarian foods consumption before lockdown period (BLD) and During lockdown period (DLP).**

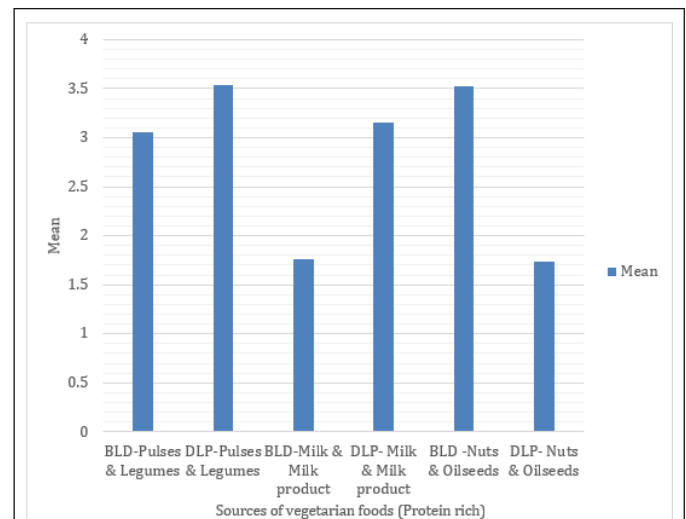
	Pulses & legumes _ BLD	Pulses & legumes- DLP	Milk & Milk products _ BLD	Milk & Milk products _ DLP	Nuts & oilseeds _ BLD	Nuts & oilseeds _ DLP
Never	2	3	19	3	1	24
Once in 15 days	10	6	29	9	8	26
Once a week	21	18	20	13	14	18
2-3 times a week	37	25	24	41	33	22
4-5 times a week	8	3	5	12	2	5
Daily	22	45	3	22	42	5
Total	100	100	100	100	100	100

22% participants consumed pulses and legumes daily before lockdown period which increased to 45% participants during lockdown period. 10% participants consumed pulses and legumes fortnightly which declined to 6% during lockdown. 21% participants consumed weekly before lockdown which decreased to 18% during lockdown. 37% participants consumed pulses and legumes two-three times a week before lockdown which decreased to 25% participants during lockdown period. Therefore, there was a decline in participants weekly and fortnight consumption with a sharp increase in daily consumption.

19% participants never had milk or milk products before lockdown which reduced to only 3% as more people started consuming milk or milk products during lockdown period. There was decline in fortnightly and once a week con-

sumption. 29% participants had consumed fortnightly before the lockdown which reduced to 9% during the lockdown period. 20% used to consume weekly before lockdown period which reduced to 13% during lockdown. Only 5% participants consumed 4-5 times a week before lockdown which increased to 22% during lockdown period. 3% participants had consumed daily before the lockdown period which increased by 22% during lockdown period. Thus, milk & milk products consumption increased during the lockdown period.

42% participants used to consume nuts and oilseeds daily before lockdown period which sharply declined to only 5% participants having consumed daily. Only 1% of participants didn't eat nuts and oilseeds before the lockdown period but it increased to 24% not consuming it during the lockdown period.. 14% participants had consumed once a week before lockdown period which increased to 18% during lockdown period. The sharp decline in nuts and oilseeds consumption during the lockdown period might be due to the effect of the lockdown on the socio-economic status of participants as nuts and oilseeds are costly. (Table No. 1)



**Fig 4: Paired Samples Statistics of Before & During lockdown period-protein source vegetarian foods consumption**

The consumption of pulses and legumes ( $3.05 \pm 1.329$ ) before lockdown was increased significantly ( $3.54 \pm 1.500$ ) during lockdown period ( $p = 0.002^{**}$ ). Similarly, Milk & Milk products consumption before lockdown period ( $1.76 \pm 1.311$ ) was also increased ( $3.16 \pm 1.314$ ) during lockdown period. The significant relationship was found between before and during lockdown milk & milk product consumption ( $p = 0.001^{**}$ ). The Nuts and oilseeds consumption ( $3.53 \pm 1.410$ ) before lockdown was highly declined during lockdown period ( $1.73 \pm 1.427$ ) and a significant relationship was found between them. ( $p = 0.001^{**}$ ). (Fig No. 4)

### 3.8. Level of difficulty faced while shifting towards vegetarian food:

Participants were asked to choose the level of difficulty they faced while shifting towards vegetarian foods. The results obtained were that 32% participants felt neutral followed by 28% participants who felt easy and another 28% participants who experienced moderate levels of difficulty. The remaining 12% participants faced difficulties while bringing change in dietary pattern during the lockdown period.

### 3.11. Problems developed during lockdown period:

The participants were asked to choose the problems developed during the lockdown period. Out of 100% participants, 33% participants did not develop any problem while the remaining 67% participants developed some or other problems during the lockdown period. 14% participants experienced joint pain, 11% subjects suffered from muscle pain, 31% participants experienced fatigue while 27% participants had lack of energy during lockdown period. The major problems developed were hair fall experienced by around 42% participants. 8% participants experienced weight loss while 12% participants developed skin problems and 20% participants experienced depression. Thus, the majority of participants developed different kinds of health issues during the lockdown period.

### 3.12. Health issues developed during lockdown period:

The participants were asked to choose the health issues developed during the lockdown period. 62% participants did not develop any issues. 12% participants developed eye related issues, 13% participants developed bone related issues, 23% experienced decreased immunity, while 2% reported vertigo and body pain.

### 3.13. Deficiencies developed during the lockdown period:

61% participants did not develop any deficiencies while consuming protein sources from vegetarian foods. 18% participants reported decreased haemoglobin levels, 12% reported iron deficiency, 5% reported vitamin B12 deficiency, 24% reported vitamin D deficiency and 13% reported calcium deficiency while



on protein source vegetarian food consumption.

### 3.14. Supplements during Lockdown period:

The participants were asked whether they were consuming vitamins, minerals or any other pills or supplements to which 9% reported having consumed supplements and 91% participants did not consume any supplements. The participants who reported consuming supplements were taking pills such as omega-3, calcimax- 500, iron tablet, vitamin D3, Geo D3, protein B, limcee, osteo calcium and multivitamin.

### 4. SUMMARY AND CONCLUSIONS:

The BMI of participants decreased during the lockdown period. 41% participants had normal BMI before lockdown which increased to 51% participants during lockdown as many people transformed into normal BMI category from underweight and overweight category. The paired sample statistics of BMI revealed that mean BMI of participants decreased during the lockdown period. The assessment of non-vegetarian foods consumption before lockdown period revealed that majority of participants used to consume eggs and chicken 2-3 times a week whereas meat was consumed by them fortnightly, fish on weekly basis and dry fish, prawns, crabs, lobster fortnightly. They sometimes had accessibility to Non-Vegetarian food during the lockdown period where egg was most accessible and dry fish, prawns, crabs, lobster was least accessible. The participants didn't consume non-vegetarian foods because of unavailability and also because of fear of covid-19. 40% participants avoided consumption of non-vegetarian foods despite being available in their locality. The participants were also assessed for the non-vegetarian foods consumption during the lockdown period. It was found out that 25% participants consumed eggs on a weekly basis and its daily consumption was decreased. Similarly, 31% participants used to consume chicken on a weekly basis and 17% participants have never consumed chicken during the lockdown period. 34% participants had never consumed meat during the lockdown period and 38% participants had consumed fortnightly. 36% participants had never consumed fish during the lockdown period while the remaining participants had consumed weekly or fortnightly. 56% participants had never consumed dry fish, prawns, crabs, and lobster during lockdown period and the remaining had consumed fortnightly. The paired sample statistics of Non-Vegetarian foods consumption gave the result that all the sources of Non-Vegetarian foods consumption decreased during the lockdown period. Participants craved non-vegetarian foods during the lockdown period out of which chicken was the most craved food. They felt there were only a few options available for preparing meals as the non-vegetarian foods were not being cooked. The participants were assessed for the protein source vegetarian foods consumption before and during the lockdown period. The results obtained were that only 22% participants used to consume pulses and legumes daily before lockdown which increased to 45% during lockdown period. Milk and milk products were consumed by 24% participants two-three times a week before lockdown that increased to 42% during lockdown period. 1% participants had never consumed nuts and oilseeds before lockdown, which increased to 17% during the lockdown period. The paired sample statistics showed that mean for pulses, legumes, milk and milk products consumption was increased during lockdown and mean for nuts and oilseeds decreased during the lockdown period. The participants were looking forward to Non-vegetarian foods consumption.

The participants were asked for the problems developed during the lockdown period. They reported experiencing joint pain, muscle pain, fatigue, hair fall, skin problems, depression while some didn't develop any health problems. Though, majority of participants were healthy, some reported low haemoglobin levels, iron deficiency, vitamin B12 deficiency, Vitamin D and Calcium deficiency. The nutritional problems developed during the lockdown period was not majorly because of not consuming non-vegetarian foods but because of low total protein intake. The participants must be made aware of the variety of protein sources from the vegetarian as well as non-vegetarian foods so that they can eat wisely and don't develop any health issues.

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### Author Contributions (required)

Dr. Rupali Sengupta guided the research.

Conflicts of Interest : No conflict of interest.

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